IN THE CLAIMS:

1-25 (canceled)

26. (new) A high frequency plasma beam source comprising a plasma chamber for a plasma, electrical means for igniting and sustaining the plasma, an extraction grid at a high-frequency potential for extracting a plasma beam (I) from a plasma chamber as well as an outlet opening, preferably to a vacuum chamber, the extraction grid being arranged in the area of the outlet opening, wherein the plasma beam is made of a divergent shape by a specific interaction between the plasma and the extraction grid.

27. (new) The high-frequency plasma beam source according to claim 26, wherein the divergency of the plasma beams (I) is achieved by a non-planar shape or a large mesh width in the extraction grid.

28. (new) The high-frequency plasma beam source according to claim 26, wherein the achievement of a high homogeneity of the plasma current density on at least a portion of a curved, especially spherical surface that is to be irradiated, the plasma beam (I) is adapted to the shape of at least a portion of the surface area.

29. (new) The high-frequency plasma beam source according to claim 26, wherein the extraction grid, as seen from the plasma chamber, is of concave shape

30. (new) The high-frequency plasma beam source according to claim 26, wherein the extraction grid is of a non-uniform shape over at least a portion of its surface.

31. (new) The high-frequency plasma beam source according to claim 26, wherein at least one mask disposed outside of the plasma chamber is provided.

32. (new) The high-frequency plasma beam source according to claim 26, wherein the exit opening is covered with masks in areas.

33. (new) The high-frequency plasma beam source according to claim 26, wherein the extraction grid has meshes with a mesh width that is less than the thickness of the space charge zone between extraction grid and the plasma in the plasma chamber.

34. (new) The high-frequency plasma beam source according to claim 26, wherein the extraction grid has meshes with a mesh width that is at least as great as a thickness of the space charge zone between the extraction grid and the plasma in the plasma chamber.

35. (new) The high-frequency plasma beam source according to claim 34, wherein the extraction grid has meshes with a mesh width that is no more than large enough for the plasma to remain substantially within the plasma space.

36. (new) The high-frequency plasma beam source according to claim 26, wherein at lease one mask is provided with an electrical potential for the modulation of the plasma beam (I).

37. (new) The high-frequency plasma beam source according to claim 26, wherein in a coating chamber, substantially opposite the exit opening, a curved surface with substrates.

38. (new) The high frequency plasma bean source according to claim 37, wherein the curved surface is a dome.

39. (new) The high-frequency plasma beam source according to claim 26, wherein an evaporating source is provided in addition to the high-frequency plasma beam source.

40. (new) High-frequency plasma beam source according to claim 26, wherein the extraction grid is formed by a tungsten mesh with a wire thickness of about 0.02 - 3 mm.

41. (new) High-frequency plasma beam source according to claim 26, wherein at least one magnet is provided for locking the plasma in the area of the plasma chamber.

42. (new) A vacuum chamber comprising
a housing;
a high-frequency beam source; and
a surface to be irradiated, wherein the high-frequency plasma beam source is configured according to claim 26.

43. (new) A vacuum chamber according to claim 42, wherein the surface to be irradiated is curved, preferably a dome and comprises one or more substrates.

44. (new) A method for irradiating a surface with a plasma beam of a high-frequency plasma beam source, consisting of a divergent plasma beam is used and the high-frequency plasma beam source is configured according to claim 25.

45. (new) A method according to claim 44, wherein the plasma beam has a beam characteristic with a divergence of no more than $n = 16$, n being an exponent of a cosine distribution function.

46. (new) The method of claim 45, wherein $n = 4$.

47. (new) A method according to at least claim 44, wherein the beam characteristic of the plasma beam is brought about by a controlled interaction between the plasma and an extraction grid.

48. (new) A method according to claim 44, wherein a controlled interaction between an extracted plasma and at least one mask disposed outside of the plasma chamber is used.

49. (new) A method according to claim 44, wherein for the achievement of a great homogeneity of the plasma beam density on at least a portion of a surface, the beam characteristic of the plasma beam is adapted to at least a portion of the irradiated surface.

50. (new) A method according to claim 44, wherein a curved surface is provided.

51. (new) A method according to claim 44, wherein the surface is coated by the irradiation of the surface.

52. (new) A method according to claim 44, wherein the surface is cleaned or modified by the irradiation of the surface.

53. (new) The method according to claim 50, wherein the curved surface is a dome.

54. (new) The high frequency plasma beam source according to claim 29, wherein a portion of the surface of the extraction grid is a section of a mantle surface of a cylindrical body.